# Landsat Data Continuity Mission (LDCM) Status

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#### LDCM History



- The Land Remote Sensing Policy Act of 1992 called for continuous satellite acquisitions. The LDCM was established to investigate and research options for the most feasible solution.
- First attempt for a commercial/government LDCM partnership was in 2003, but this was cancelled due to a lack of industry interest and inappropriate risk balancing.
- In an August 13, 2004 memorandum from the Office of Science and Technology Policy (OTSP), the USGS and NASA were directed to establish a partnership with NOAA for placement of a Landsat-like sensor on two satellites of the National Polar-orbiting Operational Environmental Satellite System (NPOESS) series.
- An OSTP memorandum issued on December 23, 2005 halted NPOESS plans and instead authorized NASA and the DOI/USGS to plan for a free-flyer spacecraft with appropriate instrumentation.

#### **OSTP Memoranda on Landsat**

DCM

- The President's Science Advisor, Dr. John Marburger, III, signed a memo on August 13, 2004 providing direction on the future of the Landsat program. The memo states:
  - "Landsat is a national asset, and its data have made - continue to make - important contributions to U.S. economic, environmental, and national security interests."
  - "the United States Government will transition the Landsat program from a series of independently planned missions to a sustained operational program"

#### **OSTP Memoranda on Landsat**

**DCM** 

- Ensuring long-term continuity...
  - "It remains the goal of the U.S. Government to transition the Landsat program from a series of independently planned missions to a sustained operational program funded and managed by a U.S. Government operational agency or agencies, international consortium, and/or commercial partnership. The National Science and Technology Council, in coordination with NASA, DOI/USGS, and other agencies as appropriate, will lead an effort to develop a long-term plan to achieve technical, financial, and managerial stability for operational land imaging in accord with the goals and objectives of the U.S. Integrated Earth Observation System."

#### **OSTP Memoranda on Landsat**



- December 23, 2005 Memorandum from John H. Marburger, III, Director of White House Office of Science and Technology Policy
  - Halted plans for Landsat on NPOESS
  - Authorized NASA to "acquire a single Landsat Data Continuity Mission in the form of a free-flyer spacecraft" and deliver the data to the USGS.
  - Specified that USGS would be responsible for the operations of the LDCM and for collection, archiving, processing, and distribution of land surface data.

# Landsat Data Continuity Mission

- On February 22, NASA published a synopsis of its approach to procure a free-flyer spacecraft, instrument, and operational systems/sustaining engineering support.
  - The Landsat Data Continuity Mission will have a 5-year mission life with 10-year expendable provisions.
  - NASA plans to issue the solicitation with an optional requirement for the instrument to observe a portion of the thermal spectrum.
  - Following a prescribed on-orbit acceptance period, NASA will transfer ownership of the observatory and the associated contracts to the USGS, which will then operate the spacecraft and manage the data.
  - NASA will invite industry to comment on a draft request for proposals (RFP) this spring.
  - A final RFP is slated for release in the third quarter of CY 2006.

### **General Specifications**



- Mission specifications are in final stages of definition and will released in near future.
- In general, the LDCM will feature:
  - Temporal, spectral, and spatial continuity with previous Landsat missions
  - Aggressive global data acquisition capabilities
  - Routine availability of higher level products, e.g., orthorectified
  - Data access policies suitable for large-area applications

#### **Landsat Operational Status**



- Landsat 5 continues to function and collects data over the United States and selected international ground stations
  - Expendable fuel will run out in early-2010
- Landsat 7 continues to collect global data
  - SLC failure reduces utility of Landsat 7 data for some applications
  - Expendable fuel will run out in mid-2010
- LDCM launch is TBD but will be no sooner than mid-2011

# Contingency Planning



- Climate Change Science Program Global Mid-Decadal Dataset
  - Due to the importance of Landsat for achieving CCSP science objectives, the USGS, with NASA, are developing a strategy to assemble a global high resolution ortho-rectified dataset
    - Use Landsat 5 and 7 to the extent they are suitable
    - CBERS, IRS, ASTER, etc. where Landsat data are not appropriate
  - Dataset would complement the Geocover Landsat dataset

## Contingency Planning



- USGS-NASA Data Gap Study
  - Establish a strategy for acquiring global high resolution data if/when Landsats 5 and 7 cease operations.
  - Several systems are under consideration
    - IRS ResourceSat 1, 2 (India)
    - CBERS 2, 2A, 3, 4 (China & Brazil)
    - RapidEye 1, 2, 3, 4, 5 (Germany)
    - DMC (Algeria, Nigeria, UK, China)
    - Terra/ASTER (US & Japan)
    - High-resolution U.S. commercial systems
      - IKONOS
      - Quickbird
      - OrbView-3
    - SPOT 4, 5 (France)
    - ALOS (Japan)
    - EO-1/ALI (US)





#### Landsat Science Team



- Science Team Purposes:
  - The USGS is sponsoring a Landsat Science Team that will conduct research on issues critical to the success of the LDCM mission, including data acquisition, product access and format, and science opportunities for newand past-generation Landsat data.
  - The Landsat Science Team will offer informed advice and recommendations to the USGS and NASA on topics that will affect the overall success of the LDCM mission.

#### Science Team Expertise



- Applications with emphasis on those applications that have historically been reliant on Landsat data.
- ◆ Technical needs especially those of large operational customers (e.g., global change studies, agricultural surveys, disaster assessment, etc.).
- Instrument functions including long-term calibration and image geometry and radiometer performance.
- Data issues including acquisition strategies, data access requirements and specifications, product characteristics, data management capabilities, data archiving.

# Science Team Responsibilities

LDCM

- Provide science-based feedback on critical design issues, including instrument and data systems
- Contribute to the specification and design of the data acquisition strategy and data access systems
- Conduct experiments on science and applications elements of program
- Represent the breadth of user perspectives and their requirements on product formats and product generation issues
- Provide insights on long-term issues (e.g., gap-filling options, future missions)
- Consider interoperability of Landsat with other systems currently in orbit or planned for launch within the LDCM operational timeframe
- Participate in representation tasks (e.g., provide data for demos or presentations and represent mission in selected forums including scientific meetings)

#### Science Team Composition



- Landsat Science Team will consist of approximately 16 members
  - Competed and funded seats
    - External scientists (8 research and development contracts @ \$90k average award)
  - Other competed seats supported by home organization (travel funds may be provided)
    - Federal agency scientists (3-5)
    - International scientists (2-3)
  - LDCM Ex Officio Members
    - NASA (Jim Irons, Jeff Masek)
    - USGS (Tom Loveland, John Dwyer)



# Science Team Selection Timeline

Date	Task
November 2005	Draft RFP prepared
December 2005 - March 2006	RFP reviewed and approved by USGS and DOI
April 2006	Landsat Science Team competition plans announced
April 2006	Solicitation released (45 day period for proposal submission)
May 2006	Review panelists selected and proposal reviews begin
July 2006	Panel recommendations to USGS
July 2006	USGS selects Pl's
August 2006	Contracts in place for PI's
August or September 2006	First Science Team meeting (with Landsat 7 team)



## LDCM Prototyping Activities



- Why conduct prototyping?
  - (1) identify areas of potential risk and develop mitigation strategies
  - (2) identify key technical areas for which we must develop an institutional knowledge base
  - (3) identify and formulate requirements for ground system elements

# Scope of Prototyping

Designated User Community

Requirements for Products & Services Test-bed
Development

Hardware and software Re-use, integration, development

Standard Level-1
Product R&D

Systematic radiometric correction

Systematic geometric correction

At-sensor (TOA) radiances
Precision and Terrain corrected

Level-2 Product R&D

TOA reflectance Surface reflectance View angle (BRDF) correction Level-3 Product R&D

Spectral indices
Data fusion

OLI
ALI
ETM+
TM5
TM4
MSS1
MSS2
MSS3
MSS4

MSS<sub>5</sub>

Enhanced Metadata Research

Metadata model(s) Standards Information Access
Research

Existing capabilities
Evolving technologies

Single Date

Multi-Date

Scene-based

**AOI-based** 

#### **LDCM** Information



 Consult the USGS and NASA web sites for LDCM for more updated information as it becomes available:

http://ldcm.usgs.gov/

http://ldcm.nasa.gov/

